

Set	Items	Description
S1	2890	IPP OR (ISOPENTYL PYROPHOSPHATE)
S2	32	S1 AND (ARABIDOPSIS OR THALIANA OR HAEMATOCOCCUS OR PLUVIALIS OR PHAFFIA OR RHODOZYMA)
S3	14	RD (unique items)

?t s3/3,ab/all
 >>>No matching display code(s) found in file(s): 60, 65

3/3,AB/1 (Item 1 from file: 155)
 DIALOG(R) File 155:MEDLINE(R)
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09722033 98409684

Differential expression of two isopentenyl pyrophosphate isomerases and enhanced carotenoid accumulation in a unicellular chlorophyte.

Sun Z; Cunningham FX Jr; Gantt E
 Department of Cell Biology and Molecular Genetics, University of Maryland, College Park, MD 20742, USA.
 Proc Natl Acad Sci U S A (UNITED STATES) Sep 15 1998, 95 (19) p11482-8
 , ISSN 0027-8424 Journal Code: PV3
 Languages: ENGLISH
 Document type: JOURNAL ARTICLE

The enzyme isopentenyl pyrophosphate (IPP) isomerase catalyzes the reversible isomerization of IPP to produce dimethylallyl pyrophosphate, the initial substrate leading to the biosynthesis of carotenoids and many other long-chain isoprenoids. Expression of IPP isomerase, and of two enzymes specific to the carotenoid pathway (lycopene beta-cyclase and beta-carotene-C-4-oxygenase), was followed in the green unicellular alga *Haematococcus pluvialis* after exposure to high illumination. This alga uniquely accumulates carotenoids in the cytoplasm and in late developmental stages turns deep-red in color because of accumulation of ketocarotenoids in the cytosol. The carotenoid/chlorophyll ratio increased 3-fold in wild type and 6-fold in a precocious carotenoid-accumulating mutant (Car-3) within 24 h after increasing the illumination from 20 to 150 $\mu\text{mol photon m}^{-2}\text{s}^{-1}$. Two cDNAs encoding IPP isomerase in *Haematococcus*, ipiHp1 and ipiHp2, were identified. Although otherwise highly similar (95% identity overall), the predicted sequence of ipiHp1 contained a 12-aa region not found in that of ipiHp2. This was reflected by a size difference between two polypeptides of 34 and 32.5 kDa, both of which reacted with an antibody to the product of ipiHp1. We suggest that the 32.5-kDa form is involved with the carotenoid accumulation in the cytoplasm, since the 32.5-kDa polypeptide was preferentially up-regulated by high light preceding the carotenoid increase and only this form was detected in red cysts.

3/3,AB/2 (Item 2 from file: 155)
 DIALOG(R) File 155:MEDLINE(R)
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09435475 98145438

Analysis of the isopentenyl diphosphate isomerase gene family from Arabidopsis thaliana.

Campbell M; Hahn FM; Poulter CD; Leustek T
 Division of Science, Pennsylvania State University-Erie, Behrend College, PA 16563, USA.
 Plant Mol Biol (NETHERLANDS) Jan 1998, 36 (2) p323-8, ISSN 0167-4412
 Journal Code: A60

Contract/Grant No.: GM 25521, GM, NIGMS
 Languages: ENGLISH
 Document type: JOURNAL ARTICLE

Two *Arabidopsis thaliana* cDNAs (IPP1 and IPP2) encoding isopentenyl diphosphate isomerase (IPP isomerase) were isolated by complementation of an IPP isomerase mutant strain of *Saccharomyces cerevisiae*. Both cDNAs encode enzymes with an amino terminus that may function as a transit peptide for localization in plastids. At least 31 amino acids from the amino terminus of the IPP1 protein and 56 amino acids from the amino terminus of the IPP2 protein are not essential for enzymatic activity.

Genomic DNA blot analysis confirmed that IPP1 and IPP2 are derived from a small gene family in *A. thaliana*. Based on northern analysis expression of both cDNAs occurs predominantly in roots of mature *A. thaliana* plants grown to the pre-flowering stage.

3/3,AB/3 (Item 3 from file: 155)
DIALOG(R)File 155:MEDLINE(R)
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09069690 97307851

Expression of an exogenous isopentenyl diphosphate isomerase gene enhances isoprenoid biosynthesis in *Escherichia coli*.

Kajiwara S; Fraser PD; Kondo K; Misawa N

Central Laboratories for Key Technology, Kirin Brewery Co. Ltd., 1-13-5, Fukuura, Kanazawa-ku, Yokohama-shi, Kanagawa 236, Japan.

Biochem J (ENGLAND) Jun 1 1997, 324 (Pt 2) p421-6, ISSN 0264-6021

Journal Code: 9YO

Languages: ENGLISH

Document type: JOURNAL ARTICLE

Escherichia coli expressing the *Erwinia* carotenoid biosynthesis genes, *crtE*, *crtB*, *crtI* and *crtY*, form yellow-coloured colonies due to the presence of beta-carotene. This host was used as a visible marker for evaluating regulatory systems operating in isoprenoid biosynthesis of *E. coli*. cDNAs enhancing carotenoid levels were isolated from the yeast *Phaffia rhodozyma* and the green alga *Haematococcus pluvialis*. Nucleotide sequence analysis indicated that they coded for proteins similar to isopentenyl diphosphate (IPP) isomerase of the yeast *Saccharomyces cerevisiae*. Determination of enzymic activity confirmed the identity of the gene products as IPP isomerases. The corresponding gene was isolated from the genomic library of *S. cerevisiae* based on its nucleotide sequence, and was confirmed to have the same effect as the above two IPP isomerase genes when introduced into the *E. coli* transformant accumulating beta-carotene. In the three *E. coli* strains carrying the individual exogenous IPP isomerase genes, the increases in carotenoid levels are comparable to the increases in IPP isomerase enzyme activity with reference to control strains possessing the endogenous gene alone. These results imply that IPP isomerase forms an influential step in isoprenoid biosynthesis of the prokaryote *E. coli*, with potential for the efficient production of industrially useful isoprenoids by metabolic engineering.

3/3,AB/4 (Item 4 from file: 155)
DIALOG(R)File 155:MEDLINE(R)
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08723308 96205971

***Arabidopsis thaliana* contains two differentially expressed farnesyl-diphosphate synthase genes.**

Cunillera N; Arro M; Delourme D; Karst F; Boronat A; Ferrer A

Unitat de Bioquímica, Facultat de Farmàcia, Universitat de Barcelona, Spain.

J Biol Chem (UNITED STATES) Mar 29 1996, 271 (13) p7774-80, ISSN 0021-9258 Journal Code: HIV

Languages: ENGLISH

Document type: JOURNAL ARTICLE

The enzyme farnesyl-diphosphate synthase (FPS; EC 2.5.1.1/EC 2.5.1.10) catalyzes the synthesis of farnesyl diphosphate (FPP) from isopentenyl diphosphate (IPP) and dimethylallyl diphosphate (DMAPP). This reaction is considered to be a rate-limiting step in isoprenoid biosynthesis. Southern blot analysis indicates that *Arabidopsis thaliana* contains at least 2 genes (FPS1 and FPS2) encoding FPS. The FPS1 and FPS2 genes have been cloned and characterized. The two genes have a very similar organization with regard to intron positions and exon sizes and share a high level of sequence similarity, not only in the coding region but also in the intronic sequences. Northern blot analysis showed that FPS1 and FPS2 have a different pattern of expression. FPS1 mRNA accumulates preferentially in roots and inflorescences, whereas FPS2 mRNA is predominantly expressed in

inflorescences. The cDNA corresponding to the FPS1 gene was isolated by functional complementation of a mutant yeast strain defective in FPS activity (Delourme, D., Lacroute, F., and Karst, F. (1994) Plant Mol. Biol. 26, 1867-1873). By using a reverse transcription-polymerase chain reaction strategy we have cloned the cDNA corresponding to the FPS2 gene. Analysis of the FPS2 cDNA sequence revealed an open reading frame encoding a protein of 342 amino acid residues with a predicted molecular mass of 39,825 Da. FPS1 and FPS2 isoforms share an overall amino acid identity of 90.6%.

Arabidopsis FPS2 was able to rescue the lethal phenotype of an ERG20-disrupted yeast strain. We demonstrate that FPS2 catalyzes the two successive condensations of IPP with both DMAPP and geranyl diphosphate leading to FPP. The significance of the occurrence of different FPS isoforms in plants is discussed in the context of the complex organization of the plant isoprenoid pathway.

3/3,AB/5 (Item 5 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

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08720996 96146506

Open reading frame 176 in the photosynthesis gene cluster of Rhodobacter capsulatus encodes idi, a gene for isopentenyl diphosphate isomerase.

Hahn FM; Baker JA; Poulter CD

Department of Chemistry, University of Utah, Salt Lake City 84112, USA.

J Bacteriol (UNITED STATES) Feb 1996, 178 (3) p619-24, ISSN 0021-9193

Journal Code: HH3

Contract/Grant No.: GM 25521, GM, NIGMS

Languages: ENGLISH

Document type: JOURNAL ARTICLE

Isopentenyl diphosphate (IPP) isomerase catalyzes an essential activation step in the isoprenoid biosynthetic pathway. A database search based on probes from the highly conserved regions in three eukaryotic IPP isomerases revealed substantial similarity with ORF176 in the photosynthesis gene cluster in Rhodobacter capsulatus. The open reading frame was cloned into an Escherichia coli expression vector. The encoded 20-kDa protein, which was purified in two steps by ion exchange and hydrophobic interaction chromatography, catalyzed the interconversion of IPP and dimethylallyl diphosphate. Thus, the photosynthesis gene cluster encodes all of the enzymes required to incorporate IPP into the ultimate carotenoid and bacteriochlorophyll metabolites in R. capsulatus. More recent searches uncovered additional putative open reading frames for IPP isomerase in seed-bearing plants (Oryza sativa, Arabidopsis thaliana, and Clarkia breweri), a worm (Caenorhabditis elegans), and another eubacterium (Escherichia coli). The R. capsulatus enzyme is the smallest of the IPP isomerases to be identified thus far and may consist mostly of a fundamental catalytic core for the enzyme.

3/3,AB/6 (Item 1 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

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05986622 Genuine Article#: XM342 Number of References: 27

Title: Cloning and subcellular localization of hamster and rat Isopentenyl diphosphate dimethylallyl diphosphate isomerase - A PTS1 motif targets the enzyme to peroxisomes

Author(s): Paton VG; Shackelford JE; Krisans SK (REPRINT)

Corporate Source: SAN DIEGO STATE UNIV,DEPT BIOL/SAN DIEGO//CA/92182

(REPRINT); SAN DIEGO STATE UNIV,DEPT BIOL/SAN DIEGO//CA/92182

Journal: JOURNAL OF BIOLOGICAL CHEMISTRY, 1997, V272, N30 (JUL 25), P 18945-18950

ISSN: 0021-9258 Publication date: 19970725

Publisher: AMER SOC BIOCHEMISTRY MOLECULAR BIOLOGY INC, 9650 ROCKVILLE PIKE, BETHESDA, MD 20814

Language: English Document Type: ARTICLE

Abstract: To date, isopentenyl diphosphate:dimethylallyl diphosphate isomerase (IPP isomerase; EC 5.3.3.2) is presumed to have a cytosolic

localization, However, we have recently shown that in permeabilized cells lacking cytosolic components, mevalonate can be converted to cholesterol, implying that all of the enzymes required for the conversion of mevalonate to farnesyl diphosphate are found in the peroxisome. To provide unequivocal evidence for the subcellular localization of **IPP** isomerase, in this study, we have cloned the rat and hamster homologues of **IPP** isomerase and identified the signal that targets this enzyme to peroxisomes. In addition, we also demonstrate that **IPP** isomerase is regulated at the mRNA level.

3/3,AB/7 (Item 2 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci
(c) 1999 Inst for Sci Info. All rts. reserv.

05717515 Genuine Article#: WT155 Number of References: 23
Title: Effects of random mutagenesis in a putative substrate-binding domain of geranylgeranyl diphosphate synthase upon intermediate formation and substrate specificity

Author(s): Ohnuma S (REPRINT) ; Hemmi H; Ohto C; Nakane H; Nishino T
Corporate Source: TOHOKU UNIV,DEPT BIOCHEM & ENGN, AOBA KU/SENDAI/MIYAGI
98077/JAPAN/ (REPRINT); TOYOTA MOTOR CO LTD,BIO RES LAB/TOYOTA
47171//JAPAN/

Journal: JOURNAL OF BIOCHEMISTRY, 1997, V121, N4 (APR), P696-704
ISSN: 0021-924X Publication date: 19970400
Publisher: JAPANESE BIOCHEMICAL SOC, ISHIKAWA BLDG-3F, 25-16 HONGO-5-CHOME,
BUNKYO-KU, TOKYO 113, JAPAN

Language: English Document Type: ARTICLE

Abstract: Archaeal geranylgeranyl diphosphate (GGPP) synthase catalyzes the consecutive condensation of isopentenyl diphosphate (**IPP**) with allylic diphosphates to produce GGPP with significant amounts of intermediates. To obtain information about the amino acids involved in the condensation and the release of intermediates, we randomly mutagenized two proximal regions, I and II, of the *Sulfolobus acidocaldarius* GGPP synthase gene and created two degenerate libraries, I and II, respectively. Regions I and II correspond to amino acid residues 170-173 and 166-168, respectively. The prenyltransferase activities of about 200 clones were analyzed using the in vivo red-white system and the conventional in vitro assay. Although, in library I, no mutated enzymes that failed to catalyze the formation of GGPP were found, as assayed with the red-white system, almost all the mutated enzymes exhibited weak GGPP synthesis activity, and many produced large amounts of intermediates. The formation of intermediates increased as the concentration of **IPP** was decreased or as the concentration of the allylic substrate was increased. These phenomena can be regarded as a reflection of the increased *K_m* for **IPP** and the decreased affinity for products including intermediates. On the other hand, no mutants from library II showed such changes. These results suggest that the region from 170 to 173 is concerned in the recognition of both **IPP** and allylic diphosphates, and that the change in responsiveness to prenyl diphosphates causes a change in intermediate formation.

3/3,AB/8 (Item 3 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci
(c) 1999 Inst for Sci Info. All rts. reserv.

05527078 Genuine Article#: WE548 Number of References: 33
Title: Promoter-independent cold-shock induction of *cspA* and its derepression at 37 degrees C by mRNA stabilization

Author(s): Fang L; Jiang WN; Bae WH; Inouye M (REPRINT)
Corporate Source: UNIV MED & DENT NEW JERSEY,ROBERT WOOD JOHNSON MED SCH,
DEPT BIOCHEM, 675 HOES LANE/PISCATAWAY//NJ/08854 (REPRINT); UNIV MED &
DENT NEW JERSEY,ROBERT WOOD JOHNSON MED SCH, DEPT
BIOCHEM/PISCATAWAY//NJ/08854

Journal: MOLECULAR MICROBIOLOGY, 1997, V23, N2 (JAN), P355-364
ISSN: 0950-382X Publication date: 19970100

Publisher: BLACKWELL SCIENCE LTD, OSNEY MEAD, OXFORD, OXON, ENGLAND OX2 0EL
Language: English Document Type: ARTICLE

Abstract: The gene for CspA, the major cold-shock protein of *Escherichia coli* is known to be dramatically induced upon temperature downshift. Here, we report that three-base substitutions around the Shine-Dalgarno sequence in the 159-base 5'-untranslated region of the cspA mRNA stabilizes the mRNA 150-fold, resulting in constitutive expression of cspA at 37 degrees C. This stabilization was found to be at least partially due to resistance against RNase E degradation. The cold-shock induction of cspA was also achieved by exchanging its promoter with the non-cold-shock **Ipp** promoter. The results presented indicate that the cspA gene is efficiently transcribed even at 37 degrees C. However, the translation of the cspA mRNA is blocked because of its extreme instability at 37 degrees C. The presented results also demonstrate that the cspA gene is constitutively transcribed at all temperatures; however, its expression at 37 degrees C is prevented by destabilizing its mRNA.

3/3,AB/9 (Item 1 from file: 60)

DIALOG(R)File 60:CRIS/USDA

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09159971

PROJ NO: MD-J-160 AGENCY : CSRS MD.

PROJ TYPE: HATCH

START: 14 OCT 92 TERM: 30 JUN 97

FY: 1997

INVEST: GANTT E

PLANT BIOLOGY

UNIV OF MARYLAND

COLLEGE PARK MARYLAND 20742

THE CAROTENOID PATHWAY IN PLANTS: IDENTIFICATION OF GENES AND ENHANCEMENT FOR AQUACULTURE

OBJECTIVES: Major goals are to identify and sequence genes encoding enzymes of the carotenoid pathway, and to determine optimal conditions for synthesis of carotenoids important for aquaculture and in fruits and vegetables.

PRIMARY HEADINGS: R318 Noncommodity Biotechnology, Biometry; A4900 Biology of Plants and Animals; C6600 Microorganisms, Viruses, etc.; F0312 Biology-Molecular-Plant

3/3,AB/10 (Item 1 from file: 71)

DIALOG(R)File 71:ELSEVIER BIOBASE

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00815301

1998057398

Analysis of the isopentenyl diphosphate isomerase gene from *Arabidopsis thaliana*

Campbell M.; Hahn F.M.; Poulter C.D.; Leustek T.

ADDRESS: M. Campbell, Division of Science, Pennsylvania State

University-Erie, Behrend College, Erie, PA 16563, United States

Journal: Plant Molecular Biology, 36/2 (323-328), 1998, Netherlands

PUBLICATION DATE: 19980000

CODEN: PMBID

ISSN: 0167-4412

DOCUMENT TYPE: Article

LANGUAGES: English

SUMMARY LANGUAGES: English

NO. OF REFERENCES: 25

Two *Arabidopsis thaliana* cDNAs (IPP1 and IPP2) encoding isopentenyl diphosphate isomerase (IPP isomerase) were isolated by complementation of an IPP isomerase mutant strain of *Saccharomyces cerevisiae*. Both cDNAs encode enzymes with an amino terminus that may function as a transit peptide for localization in plastids. At least 31 amino acids from the

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13061905 PASCAL No.: 97-0352290

Contribution a l'etude de la regulation de la biosynthese des carotenoides chez le poivron (*Capsicum annuum* L.): isolement du gene GGPPS, clonage et caracterisation des ADNc codants pour les enzymes IPP-isomerase et Lycopene beta-cyclase

(A contribution to the study of the regulation of the carotenoids biosynthetic pathway in bell pepper (*Capsicum annuum* L.): Isolation of the GGPPS gene, cloning and characterisation of the cDNA CODING FOR THE ENZYMES IPP-isomerase and lycopene beta-cyclase)

BADILLO-UJUETA Alfredo; WEIL J H, dir

Universite de Strasbourg 1, Strasbourg, Francee

Univ.: Universite de Strasbourg 1. Strasbourg. FRA Degree: Th. doct.

1996-12; 1996 112 p.

Language: French Summary Language: French; English

Dans certains fruits comme le fruit de poivron, les chromoplastes sont le resultat de la profonde transformation de chloroplastes preexistant lors du processus de murissement des fruits. Le changement le plus remarquable est la synthese et l'accumulation de nouveaux carotenoides, differents de ceux presents dans les tissus verts. Tous ces evenements impliquent une regulation complexe de l'expression des genes durant le developpement de la plante. Nous avons clone et caracterise deux ADNc codant pour des enzymes de la voie de biosynthese des carotenoides, la lycopene B-cyclase et l'isopentenyl diphosphate isomerase (IPP-isomerase). Egalement, nous avons isole un clone genomique codant pour l'enzyme geranylgeranyl pyrophosphate synthase (GGPPS) dont la fonctionnalite a ete demontree par des experiences d'expression transitoire. Nous avons trouve qu'une enzyme en aval dans la voie de biosynthese, la capsanthine-capsorubine synthase (CCS), laquelle est fortement induite durant le stade rouge du developpement du fruit, a une capacite catalytique double: une activite violaxanthine et antheraxanthine de-epoxydase additionne d'un niveau significatif d'activite B-cyclase. Nous avons propose que, dans le fruit de poivron, l'induction de la transcription du gene CCS serait la cause principale de la deviation du flux des intermediaires vers la synthese et l'accumulation des carotenoides du type B presents dans les chromoplastes des fruits rouges. L'expression des genes IPP-isomerase chez *Arabidopsis* ne semble pas etre affectee par le traitement avec l'herbicide norflurazon, un inhibiteur de la synthese des carotenoides. Sur ce point, le gene IPP-isomerase differe des autres genes de la voie de synthese des carotenoides lesquels sont induits dans de telles conditions. De facon similaire, le niveau de transcrit IPP-isomerase ne semble pas augmenter de maniere importante dans le fruit de poivron lors du processus de murissement. Ces resultats peuvent refleter le fait que le substrat et le produit de cette enzyme sont egalement utilises dans la biosynthese d'autres terpenoides distinct des carotenoides

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3/3,AB/14 (Item 1 from file: 357)

DIALOG(R) File 357:Derwent Biotechnology Abs

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0218242 DBA Accession No.: 97-13363 PATENT

**Eukaryotic carotenoid biosynthetic enzymes and related genes-
epsilon-cyclase, isopentenyl-pyrophosphate-isomerase and
beta-carotene-hydroxylase gene expression in e.g. *Escherichia coli* for
carotenoid production**

AUTHOR: Cunningham Jr F X; Sun Z

CORPORATE SOURCE: College Park, MD, USA.

PATENT ASSIGNEE: Univ.Maryland 1997

PATENT NUMBER: WO 9736998 PATENT DATE: 971009 WPI ACCESSION NO.:

97-503091 (9746)

PRIORITY APPLIC. NO.: US 624125 APPLIC. DATE: 960329

NATIONAL APPLIC. NO.: WO 97US540 APPLIC. DATE: 970128

LANGUAGE: English

ABSTRACT: Isolated eukaryotic enzymes having the 524 (*Arabidopsis*

thaliana epsilon-cyclase), 294 (*A. thaliana* beta-carotene-hydroxylase), 305 or 293 (*Haematococcus pluvialis* isopentenyl-pyrophosphate (IPP)-isomerase) and 284 or 261 (*A. thaliana* IPP-isomerase) amino acid protein sequences (specified) are new. Also claimed are: an isolated DNA sequence, preferably having the 1,860, 954, 996, 1,165, 1,135 or 956 bp DNA sequence (specified), encoding the 294, 305, 293, 284, 261 or 294 residue sequences; an expression vector, preferably plasmid pATeps, plasmid pHP05, plasmid pMDP1, plasmid pATDP7, plasmid pHP04 or plasmid pAT0HB (ATCC 98005, 98000, 98001, 98002, 98004 or 98003), containing the DNA sequence; a host cell (e.g. *Escherichia coli*) containing the expression vector; and a DNA sequence which results in the expression of a eukaryotic carotenoid biosynthetic enzyme. The following methods are also claimed: screening for eukaryotic genes involved in carotenoid biosynthesis, metabolism or degradation; producing a carotenoid; inhibiting carotenoid synthesis in a host; increasing the production of a secondary metabolite of IPP-isomerase by a host. (89pp)

?ds

Set	Items	Description
S1	2890	IPP OR (ISOPENTYL PYROPHOSPHATE)
S2	32	S1 AND (ARABIDOPSIS OR THALIANA OR HAEMATOCOCCUS OR PLUVIALIS OR PHAFFIA OR RHODOZYMA)
S3	14	RD (unique items)
?		



Creation date: 03-12-2004
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Team: OIPEBackFileIndexing
Dossier: 08737319

Legal Date: 08-17-1998

No.	Doccode	Number of pages
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2	892	1
3	1449	2
4	NFDR	1

Total number of pages: 14

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Order of re-scan issued on